

What is claimed is:

1. An apparatus for processing foodstuff comprising:
a transport having an entry and an exit different from said entry, wherein a food product enters said transport via said entry and moves to said exit;
one or more germicidal emitters for emitting a germicidal so that said germicidal
5 inactivates one or more micro-organisms on surfaces of the food product in said transport, wherein said germicidal emitters are capable of withstanding a plurality of water sprays having pressures of up to 1,400 psig, and at temperatures up to 210 degrees Fahrenheit without said emitters failing due to one or more of water or heat damage substantially resulting from said sprays;
10 an assembly for securing at least some of said germicidal emitters in a predetermined arrangement, wherein said assembly with its secured emitters is moveable between a first position wherein said secured emitters are operable for inactivating the one or more micro-organisms on surfaces of the food product in said transport, and a second position wherein said secured emitters are substantially inoperable for inactivating
15 the one or more micro-organisms on surfaces of the food product in said transport;
wherein said second position is a preferred assembly position for one or more of: cleaning said assembly, cleaning said secured emitters, detaching an emitter from said assembly, securing an emitter to said assembly; and
one or more moveable tumblers for contacting the food product in said transport,
20 wherein movement of said tumblers lift the food product in said transport so that the food product tumbles within said transport while the food product in said transport is exposed to said germicidal.
2. The apparatus of Claim 1, wherein germicidal emitters are capable of withstanding water sprays approximately no more than 1,350 psig.
3. The apparatus of Claim 1, wherein the water sprays are approximately 1,250 psig.
4. The apparatus of Claim 1, wherein germicidal emitters are capable of withstanding water sprays approximately no more than 200 degrees Fahrenheit.
5. The apparatus of Claim 1, wherein the water sprays are approximately 195 degrees Fahrenheit.

6. The apparatus of Claim 1 wherein the said transport includes a drum for rotating the food product, wherein said entry includes a first end of the drum and said exit includes a second end of the drum.
7. The apparatus of Claim 6, wherein said drum includes at least one of said tumblers is attached to an interior surface of said drum.
8. The apparatus of Claim 7, wherein said at least tumbler includes a projection that extends from said drum interior surface toward an axis of drum rotation.
9. The apparatus of Claim 8, wherein said projection also extends from a first end substantially adjacent to said entry to a second end substantially adjacent to said exit.
10. The apparatus of Claim 8, wherein said projection has a spiral shape between said first and second ends.
11. The apparatus of Claim 9, wherein said drum has a downward inclination from said entry to said exit.
12. The apparatus of Claim 6 wherein said tumblers rotate with a rotation of said drum.
13. The apparatus of Claim 7 wherein said tumblers are attached an interior circumference of said drum.
14. The apparatus of Claim 6, wherein at least one of said tumblers includes at least one recess on an interior of said drum, wherein said recess extends away from an axis of drum rotation
15. The apparatus of Claim 14, wherein a cross section of said drum interior has a polygonal shape and said recess includes a vertex of the polygonal shape.
16. The apparatus of Claim 6 further comprises a drive mechanism for providing a rotational motion to said drum, wherein said drive mechanism includes one of an electric, hydraulic, and pneumatic motor for operatively rotating an belt about an exterior of said drum.
17. The apparatus of claim 1, wherein said germicidal includes one or more of radiation, light waves, sound waves, and ozone.
18. The apparatus of claim 1, wherein said germicidal is ultraviolet light in the C wavelength band.

19. The apparatus of claim 1, wherein said emitters are sleeved with a plastic for containment of glass in said emitters.
20. The apparatus of claim 1, wherein said emitters are capable of food product surface sterilization at a temperature of -40 degrees Fahrenheit.
21. The apparatus of Claim 1 further including one or more germicidal attenuating baffles for effectively preventing said germicidal from exiting from a predetermined volume, wherein said baffles are sufficiently close to said transport so that personnel adjacent to said transport but outside said predetermined volume are not exposed to an unsafe amount of said germicidal.
22. The apparatus of Claim 1, wherein an exposure of said germicidal to said food product surfaces does not substantially increase the temperature of said food product when said germicidal inactivates one or more micro-organisms on surfaces of the food product in said transport.
23. The apparatus of Claim 1, wherein an application of said germicidal to said food product surfaces does not substantially alter a flavor, texture, color, or other eating characteristics of said food product.
24. The apparatus of Claim 1, wherein said food product includes raw potatoes for thereby reducing at potato spoilage.
25. The apparatus of Claim 1, wherein said food product includes one of: a spice, an herb, grains, nuts, rice, a cereal, crackers, a dehydrated food product, potato chips, corn chips, pork rinds, beef jerky, and a quick frozen food product.
26. The apparatus of Claim 24, wherein said quick frozen food product includes one of: corn, peas, carrots, whole potatoes, dehydrated potatoes, figs, peppers, French-fried potatoes, beef crumbles, beef trimmings, fajita meats, and shrimp.
27. The apparatus of Claim 1, wherein said food product includes a fresh food product.
28. The apparatus of Claim 27, wherein said fresh food product includes one of: potato dices and shreds, carrots, asparagus, broccoli, cauliflower, onions, brussels sprouts, corn, peas, cucumbers, lettuce, beans, grains, beef, chicken, fish, shrimp, herbs, fruits, blueberries, cranberries, peeled and unpeeled tomatoes.

29. The apparatus of Claim 1, wherein said germicidal does not include a sterilizing chemical.
30. The apparatus of Claim 1, wherein the tumbling of the food product does not cause substantial breakage of the food product.
31. The apparatus of Claim 1, wherein at least one of said tumblers is replaceable by a tumbler having a different shape or size.
32. The apparatus of Claim 1, wherein said germicidal reduces at least one of mold, fungi, bacteria, yeast, and the egg and/or larva of insects.
33. The apparatus of Claim 1, wherein the said transport includes a screw conveyor including an auger assembly for conveying the food product from said entry to said exit.
34. The apparatus of Claim 33 wherein said screw conveyor includes at least one of said tumblers between flights of the auger.
35. The apparatus of Claim 34 wherein the said at least one tumbler includes a projection that is attached to and extends from one of said flights towards an axis of rotation for said auger assembly.
36. The apparatus of Claim 34 wherein said at least one tumbler rotates with a rotation of said auger assembly.
37. The apparatus of Claim 33 wherein said screw conveyor has a downward, level, or upward inclination from said entry to said exit.
38. The apparatus of Claim 33 further comprises a drive mechanism for providing a rotational motion to said auger assembly, wherein said drive mechanism includes one of an electric, hydraulic, and pneumatic motor for operatively rotating said auger assembly.
39. The apparatus of claim 33, wherein said at least one tumbler is fastened between said flights.
40. The apparatus of claim 33, wherein said germicidal includes ultraviolet light in the C wavelength band.
41. The apparatus of claim 33, wherein said assembly for securing at least some of said emitters exposes the food product to said germicidal within the transport for thereby reducing at least one of mold, fungi, bacteria, yeast, and the egg and/or larva of insects.
42. The apparatus of Claim 1 further including a controller for performing one or more of the following actions:

- 5 (a) regulating an amount of the food product entering the transport, wherein said controller uses data indicative of an amount of food product in said transport, said data dependent upon sensor information related to an amount of food product in the transport;
- 10 (b) obtaining germicidal information indicative of an amount of said germicidal required from said germicidal emitter for inactivating a predetermined amount of the micro-organisms, whereby said controller determines information for identifying an amount of the germicidal for emission by said germicidal emitter;
- 15 (c) outputting one or more signals for changing a rate of movement of said tumblers for maintaining a predetermined degree inactivation of the micro-organisms;
- (d) outputting one or more signals for changing an inclination of said transport for maintaining a predetermined degree inactivation of the micro-organisms;
- 20 (e) predicting an amount of the food product which will be in the transport at a future time, wherein said controller uses sensor data indicative of an amount of food product being moved to said entry;
- 25 (f) preferring a first germicidal emission rate to a second germicidal emission rate, wherein said first germicidal emission rate is obtained in response to a user input for setting a germicidal emission rate for the germicidal emitters, and said second germicidal emission rate is not obtained in response to input from the user for setting a germicidal emission rate for the germicidal emitters, and wherein said second germicidal emission rate is used when said user input is not provided.

43. The apparatus of Claim 42, wherein said controller performs at least most of the actions (a) through (f).

44. An apparatus for processing foodstuff comprising:

a transport having an entry and an exit different from said entry, wherein a food product enters said transport via said entry and moves to said exit;

5 one or more germicidal emitters for emitting a germicidal so that said germicidal
inactivates one or more micro-organisms on surfaces of the food product in said
transport;

one or more moveable tumblers for contacting the food product in said transport,
wherein movement of said tumblers lift the food product in said transport so that the food
product tumbles within said transport while the food product in said transport is exposed
10 to said germicidal; and

a controller for performing one or more of the following actions:

- 15 (a) regulating an amount of the food product entering the transport, wherein
said controller uses data indicative of an amount of food product in said
transport, said data dependent upon sensor information related to an
amount of food product in the transport;
- (b) obtaining germicidal information indicative of an amount of said
germicidal required from said germicidal emitter for inactivating a
predetermined amount of the micro-organisms, whereby said controller
determines information for identifying an amount of the germicidal for
20 emission by said germicidal emitter;
- (c) outputting one or more signals for changing a rate of movement of said
tumblers for maintaining a predetermined degree of inactivation of the
micro-organisms;
- 25 (d) outputting one or more signals for changing an inclination of said
transport for maintaining a predetermined degree of inactivation of the
micro-organisms;
- (e) predicting an amount of the food product which will be in the transport at
a future time, wherein said controller uses sensor data indicative of an
amount of food product being moved to said entry;
- 30 (f) preferring a first germicidal emission rate to a second germicidal emission
rate, wherein said first germicidal emission rate is obtained in response to
a user input for setting a germicidal emission rate for the germicidal
emitters, and said second germicidal emission rate is not obtained in
response to input from the user for setting a germicidal emission rate for

- 35 the germicidal emitters, and wherein said second germicidal emission rate
is used when said user input is not provided.
45. The apparatus of Claim 44 further including a data storage that includes, for each
of a plurality of different food products, an amount of the germicidal to be emitted by said
emitters for inactivating a particular degree of one or more micro-organisms on the surface
of the food product.
46. The apparatus of Claim 44, wherein said controller performs at least some of the
actions (a) through (f).
47. The apparatus of Claim 44, wherein said controller performs at least most of the
actions (a) through (f).
48. The apparatus of Claim 44, wherein said controller performs all of the actions (a)
through (f).
49. The apparatus of Claim 44, wherein at least one of said tumblers is replaceable by
a tumbler having a different shape or size.
50. The apparatus of Claim 44, wherein said transport includes a drum through which
the food product passes, and said apparatus further includes a drive mechanism for
rotating said drum with the food product therein.
51. The apparatus of Claim 44, wherein said controller determines whether a request
for reconfiguring said apparatus is safe to both personnel within a proximity of the
apparatus, and sterilizes the food product to a predetermined degree.
52. A method for surface sterilization of one or more food products, comprising:
 first determining a size for a food product transport having an entry and an exit
different from said entry, wherein a food product enters said transport via said entry and
moves to said exit;
- 5 wherein said transport includes one or more tumblers for contacting the food
product in said transport, wherein movement of said tumblers lift the food product in said
transport so that the food product tumbles within said transport;
- second determining at least one of a quantity and configuration of one or more
emitters of a germicidal relative to the food product in said transport, wherein said
10 germicidal inactivates one or more micro-organisms on a surface of the food product in
said transport;

wherein said first and second determining steps are dependent upon at least some of (a) through (f) following:

- (a) a rate at which a food product is provided for surface sterilization;
- 15 (b) an amount of the germicidal to be emitted by said emitters for inactivating a particular quantity of one or more micro-organisms on the surface of the food product;
- (c) an amount of the germicidal to which the food product is expected to be exposed in said transport;
- 20 (d) an elapsed time that an individual item of the food product is expected to be in said transport;
- (e) a shape and a density of the food product;
- (f) a temperature of the food product.